



US Army Corps  
of Engineers

## Code Forum

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### CEMP-C

**Subject:** Elevators-Final Acceptance Inspection

**Applicability:** Information

Code References: ASME A17.1 (1996 Edition), A17.2 (1994 Edition), A17.3 (1994 Edition), National Electric Code (1993 Edition) & The Uniform Federal Accessibility Standards (1985 Edition),

Discussion: The elevator car is the first order of review. It must be checked for safety-code requirements as well as for specifications requirements. While the size of the car enclosure, ventilation, and illumination should have been checked at the time of contractor submittal, these must be assured now. Code requirements cover each of these items. In addition, this is what the public sees of an elevator installation and should be closely reviewed for specification requirements and workmanship.

#### Key Requirements Include:

All elevators are provided with an emergency exit in the top, which must be operable only from the top of the car. This exit should be checked for size and proper operation, the installation should include an electric contact which opens when the exit is opened, thus preventing the car from moving.

In addition to top exits, some installations have side exits. In a three car common-hoist way arrangement, the middle car may have an exit in both sides. These exits must swing in and be opened from the inside only by using a special-shape removable key, be opened from the outside by a nonremovable handle, and be provided with an electric contact which prevents the car from moving when the exit is open. The distance between cars should not exceed 30 inches, and no fixed obstructions other than separator beams must exist between the cars.

The operation of car doors must be examined thoroughly. Whether the doors move horizontally or vertically, they must be closely reviewed. Closing force, reopening devices, full sequence of door and gate closing in the case of vertically operated entrance assemblies, open and close limits, and smooth operation are all functions which must be checked. Audible warnings, as in the case of vertically operated doors provided with an automatic closing feature or in case of vertically operated doors provided with a feature that cuts out some reopening devices and allows the doors to move closed at a reduced speed, should be checked for proper operation and provision of the intended notification.

Car-operating and signal fixtures should be reviewed for specification compliance, workmanship, appearance, and proper operation. Standards for accessibility by handicapped persons include specific suggestions and requirements concerning these devices. These suggestions and requirements should be considered when inspecting these devices. Included in each car-operating panel is a red emergency stop switch which, when operated, will promptly stop the elevator and sound the alarm bell. An alarm switch or button should also be included in the panel to activate the alarm bell.

Every elevator must be provided with a means of two-way communications. Additional requirements are imposed for buildings which are not provided with continuous supervision or for buildings which must have specific fire communications. Specific requirements should be reviewed to assure proper compliance.

All passenger elevators must be provided with an on-board emergency-lighting source. The lighting shall illuminate the car operating panel with a minimum of 0.2-fc ( 2.15-lx) intensity for a minimum of 4 hours.

The capacity of all elevators must be displayed in a conspicuous position inside the car. A freight elevator must also include a sign that identifies it as a freight elevator, states that passengers are not permitted to ride, and stipulates the type of loading for which the elevator was designed.

An extremely important part of the inspection is the thorough investigation of each hoist way entrance. Assurance that the frame is properly interfaced into the front-wall construction is essential to maintain the fire rating. The interface must be in accordance with the frame manufacturer's instructions; normally this stipulation is carried out by the wall constructor. Each entrance should be closely checked to assure that maximum clearance has been maintained and that the frames and door panels are straight, level, and plumb. Proper installation will assure good operation. The interlock device and overall operation should be checked for compliance with code requirements. A fire-rated entrance is required and a test label indicating the fire rating must be provided.

The corridor operating and signal fixtures should be reviewed for specification compliance, workmanship, appearance, and proper operation. Standards for accessibility by handicapped persons have specific suggestions and requirements concerning these devices, including the location of call buttons, the design and operation of corridor lanterns, and requiring a floor designation on the hoist way entrance frames. These requirements should be reviewed and applied where applicable.

Architectural considerations should also be included. These include the wall surfaces around the entrances and operating and signaling devices. Poor workmanship in this area stands out like the proverbial sore thumb. Installation of a good joint sealant between the wall and the sides and top of the hoist way entrance frame is necessary to seal the hoist way. The sealant will prevent hoist way dirt and dust from being deposited on the surface of the corridor wall because of air movement resulting from the elevator moving up and down the hoist way. A proper fit of the floor covering to the entrance sill is important. The covering should meet the sill level or be slightly below it. In addition, heavy wear and tear will result on floor covering installed above the entrance sill.

The top of each elevator car must have an operating device which will allow slow-speed

code. Assurance that these requirements have been met and that the device operates properly must be secured before the inspection is continued.

Each elevator must be provided with a refuge space on top of the car enclosure. This shall be an unobstructed area of not less than 650 inches squared and measure not less than 16 inches on any side. The minimum vertical clearance between the car top and the lowest obstruction when the car has reached its maximum upward movement requires a minimum of 42 inch refuge space.

Car frame, sheaves, ropes and fastenings, data tags, top emergency exit, door operator, leveling switches, guiding devices, work light, and convenience outlet can be checked before the car moves. Examination of the condition of the wire ropes is especially important if the elevator has been used as a material hoist or workers' elevator during construction of the building. Frequently, such ropes will be covered with lime, sand, and mortar and may be worn or damaged to such an extent that they should be replaced. If ropes show an appreciable amount of gritty building material but are otherwise sound, they should be thoroughly cleaned and relubricated in accordance with the manufacturer's recommendation.

Sheaves should be closely examined when the above conditions are evident. Rope tension should also be checked. Each rope should have been adjusted to equal tension to equalize the load on the sheaves; unequal tension can cause premature wear of a sheave. The inspector should not enter the hoist way on top of the elevator car unless accompanied by a person familiar with operation of the equipment.

A thorough inspection of the hoist way must be made to assure proper installation of items noted for inspection during the construction period. Determine that top-of-car and counterweight clearances and running clearances conform with code requirements.

Final limits should be checked for proper operation. Operation of this switch will prevent movement of the elevator by normal means in both directions of movement. Normal limits may be located in the hoist way, on the car, or in the machine room. Operation of this switch will prevent movement of the car in the up direction when the car activates the top switch and in the down direction when the bottom switch is activated. When conditions require emergency terminal speed-limiting devices, their operation also must be checked.

Traveling cables must be hung in accordance with NATIONAL ELECTRIC CODE requirements. They may be hung anywhere between the midpoint of the rise and the top of the hoist way, depending on the contractor's wiring scheme. Hoist way wiring also must comply with the respective requirements of the same code. Only elevator-related wiring is allowed in the elevator hoist way.

Examine the counterweight to determine that filler weights are securely held in place and that tie rods are properly fastened. Guide devices, rope fastenings or sheaves, buffers (if attached to the frame), and compensating ropes or chains must be inspected. If occupied space is present under the counterweight, a safety device is required on the counterweight to protect against a runaway. This device must be checked.

Safe and convenient access must be provided to all elevator pits. Access can be from the lowest hoist way door or from a separate door. If the pit extends more than 3 feet below the entry, a ladder which meets code requirements must be provided. Access shall be to authorized

entry, a ladder which meets code requirements must be provided. Access shall be to authorized persons only. The inspector should not enter the pit unless accompanied by a person familiar with operation of the equipment.

Confirm that bottom-of-car and counterweight clearances are in accordance with code requirements. This must be done first to assure operating space.

Every elevator is required to have a pit stop switch at the point of entry into the pit. If entry is by ladder, the pit stop switch shall be located 18 inches above the access-pit floor level, accessible from the entry, and adjacent to the pit ladder. When pit depth exceeds 6 ft. 7 inches, a second switch is required. It shall be located 4 ft. above the access-pit floor, adjacent to the ladder and wired in series.

A permanent lighting fixture is required. It shall operate from a switch located so as to be accessible from the pit access door.

Car and counterweight buffers shall be examined for code requirements. Specific tests are detailed for hydraulic buffers.

Pit floors are required to be approximately level. Exceptions are allowed for existing conditions and for the installation of buffers, sheaves, or vertical operating doors. Sumps are also allowed, but direct connection of sump lines to drain or sewer lines is not allowed. If adjacent pits are at different levels, protection is required. A difference of up to 2 ft. requires a metal railing not less than 42 inches high. A greater distance difference requires a 6 ft. high guard. All open sides of the counterweight runbys shall have a guard, which shall extend from not more than 12 inches above the floor to a point not less than 7 ft. or more than 8 ft. above the floor. Counterweight guards are not required when either chain or rope compensation is included.

The car safety should be closely inspected to assure proper operation. Each safety requires a data tag indicating the type, maximum tripping speed, and maximum load. Confirm that the safety is adequate for the application. The governor tension sheave must be examined to assure proper operation.

Check compensating chains or ropes, if any. Check the fastening to the bottom of the car. If ropes are used, check the tension sheave and contact in accordance with code requirements.

Bottom final and normal limit switches should be checked for proper operation just as the top switches were checked. Emergency terminal speed-limiting switches may also be required. These must be checked as previously described.

Traveling cable mounting shall be inspected along with fixed wiring for compliance with NATIONAL ELECTRIC CODE requirements.

The car platform shall be examined for code compliance. The underside of wood platforms shall be protected against fire by covering it with metal or fire-retardant paint. On the entrance side of each platform there is a guard required which extends not less than the length of the leveling zone plus 3 inches, but in no case less than 21 inches.

Machine room and machinery spaces specifications, elevator safety code, and building code; detail specific requirements concerning the type of enclosure, access, lighting, ventilation, headroom, floor construction, etc. These should be closely reviewed before inspection.

The hoisting machine should be closely examined for alignment and operation. Check all lubrication points for the proper quantity and type of lubrication in addition to possible leaks. When gear machines are used, visually check the drive gear for the correct worm-engagement pattern. The brake should also be examined for free operation and correct clearance of shoes.


Motors and generator lubrication should be checked. All connections and insulation should be examined. Brushes should also be examined and their operation checked.

Wire, starters, and fused disconnects should be checked for proper sizing. The NATIONAL ELECTRIC CODE should be consulted for requirements. The disconnect location is included in these requirements. Each hoist machine and the respective disconnect switch shall be identified.

Control equipment should be examined for general workmanship. Proper connections, insulation, and operation should be checked. Fuses should be checked specifically for proper size and mounting. All equipment must be grounded in accordance with NATIONAL ELECTRIC CODE requirements.

The overspeed governor must be checked in accordance with code requirements. Proper operation of this device is essential and must be closely checked. Equipment must be located so as to meet required clearances. These clearances must be checked to assure safe operating conditions in this area. Some local codes also require that insulated floor covering be installed around control equipment.

Conclusion: Safety testing of elevators is performed by the elevator contractor, witnessed by the enforcing authority inspector and verified by QA surveillance. The elevator safety code must be closely followed when conducting these tests. Specific requirements concerning allowable results are detailed, and these must be followed to assure safe operation. Elevator training and safety certification is available by contacting Harold Bush at HQUSACE tel# 202-761-1381.

  
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